

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) Apparatus comprising:

a plurality of droplet ejection devices, each said droplet ejection device including:

 a fluid chamber having a volume and an ejection nozzle,

 a piezoelectric actuator that moves between a displaced position and an undisplaced position to change said volume of said chamber as a capacitance associated with the piezoelectric actuator changes in charge between an actuated condition and an unactuated condition, and

 a first switch that has a first input connected to an electric source terminal, a first output connected to said piezoelectric actuator, and a first control signal input to determine whether said first input is connected to or disconnected from said first output, wherein an applied electric source distributes an electrical signal to said first inputs of said plurality of droplet ejection devices, and

 a controller that provides respective charge control signals to respective said first control signal inputs to control an extent of change in charge on respective said capacitances when the respective said first switch connects said electrical signal to the respective said piezoelectric actuator and to set a constant amount of charge on respective said capacitances in the actuated condition when the respective said first switch disconnects said electrical signal to the respective said piezoelectric actuator, wherein the disconnection maintains a constant voltage on respective said capacitances by storing the constant amount of charge on respective said capacitances, and

 wherein each of said plurality of droplet ejection devices is configured for individual control of charge accumulation on respective said capacitances and for individual control of the extent of change in charge on respective said capacitances,

wherein said electrical signal is a controlled current signal.

2. (Previously Presented) The apparatus of claim 1 wherein said piezoelectric actuator moves between a displaced position and an undisplaced position as a capacitance associated with the piezoelectric actuator changes between a charged, actuated condition and an uncharged, unactuated condition, and

wherein said controller that provides respective charge control signals to respective said first control signal inputs to control the extent of charge placed on respective said capacitances by the time that the respective said first switch connects said electrical signal to the respective said piezoelectric actuator .

3. (Previously Presented) The apparatus of claim 2

wherein each said droplet ejection device also includes a second switch that has a second input connected to a discharging electrical terminal, a second output connected to said piezoelectric actuator, and a second control signal input to determine whether said second input is connected to or disconnected from said second output, and

wherein said controller provides respective discharge control signals to respective said second control signal inputs to control discharge of the charge on said respective capacitances,

and wherein each of said plurality of droplet ejection devices is configured for individual control of the discharge of the charge on respective said capacitances.

4. (Previously Presented) The apparatus of claim 1 wherein each said droplet ejection device comprises a first resistance between said electric source and said piezoelectric actuator.

5. (Previously Presented) The apparatus of claim 3 wherein each said droplet ejection device comprises a second resistance between said discharging electrical terminal and said piezoelectric actuator.

6. (Previously Presented) The apparatus of claim 3 wherein each said droplet ejection device has a first resistance that is between said electrical source and said piezoelectric actuator and is external of an electrical path from said piezoelectric actuator to said second switch, and further comprising a second resistance that is included in the electrical path from said piezoelectric actuator to said discharging electrical terminal.

7. (Original) The apparatus of claim 3 wherein a single resistance is used to charge and discharge a respective capacitance.

8. (Previously Presented) The apparatus of claim 1 wherein a plurality of resistors, voltages and switches are connected to each said piezoelectric actuator and controlled by said controller to change the charge on said capacitance.

9. (Original) The apparatus of claim 3 wherein said discharging electrical terminal is at ground.

10.-11. (Canceled)

12. (Currently Amended) The apparatus of claim 1 Apparatus comprising:
a plurality of droplet ejection devices, each said droplet ejection device including:
a fluid chamber having a volume and an ejection nozzle,
a piezoelectric actuator that moves between a displaced position and an
undisplaced position to change said volume of said chamber as a capacitance associated with the
piezoelectric actuator changes in charge between an actuated condition and an unactuated
condition, and

a first switch that has a first input connected to an electric source terminal, a first
output connected to said piezoelectric actuator, and a first control signal input to determine
whether said first input is connected to or disconnected from said first output, wherein an applied
electric source distributes an electrical signal to said first inputs of said plurality of droplet
ejection devices, and

a controller that provides respective charge control signals to respective said first control signal inputs to control an extent of change in charge on respective said capacitances when the respective said first switch connects said electrical signal to the respective said piezoelectric actuator and to set a constant amount of charge on respective said capacitances in the actuated condition when the respective said first switch disconnects said electrical signal to the respective said piezoelectric actuator, wherein the disconnection maintains a constant voltage on respective said capacitances by storing the constant amount of charge on respective said capacitances, and wherein each of said plurality of droplet ejection devices is configured for individual control of charge accumulation on respective said capacitances and for individual control of the extent of change in charge on respective said capacitances,

wherein said electrical signal is a constant current.

13. (Currently Amended) Apparatus comprising:

a plurality of droplet ejection devices, each said droplet ejection device including:

 a fluid chamber having a volume and an ejection nozzle,
 a piezoelectric actuator that moves between a displaced position and an undisplaced position to change said volume of said chamber as a capacitance associated with the piezoelectric actuator changes between a charged, actuated condition and an uncharged, unactuated condition, and

 a first switch that has a first input connected to a voltage source terminal, a first output connected to said piezoelectric actuator, and a first control signal input to determine whether said first input is connected to or disconnected from said first output, wherein a voltage source distributes a constant voltage electrical signal to said first inputs of said plurality of droplet ejection devices, and

 a controller that provides respective charge control signals to respective said first control signal inputs to control an extent of charge placed on respective said capacitances when the respective said first switch connects said electrical signal to the respective said piezoelectric actuator and to set a constant amount of charge on respective said capacitances in the actuated condition when the respective said first switch disconnects said electrical signal to the respective

said piezoelectric actuator, wherein the disconnection maintains a constant voltage on respective said capacitances by storing the constant amount of charge on respective said capacitances, and

wherein each of said plurality of droplet ejection devices is configured for individual control of charge accumulation on respective said capacitances and for individual control of the extent of change in charge on respective said capacitances,

wherein said first control signals are controlled to inject noise into images being printed so as to break up possible print patterns and banding.

14. (Previously Presented) The apparatus of claim 13 wherein said first control signal terminates the connection of said constant voltage to said piezoelectric actuator when the charge on said piezoelectric actuator is at a predetermined value which is less than said constant voltage.

15. (Previously Presented) The apparatus of claim 13 wherein each said droplet ejection device also includes a second switch that has a second input connected to a discharging electrical terminal, a second output connected to said piezoelectric actuator, and a second control signal input to determine whether said second input is connected to or disconnected from said second output, and wherein said controller provides respective discharge control signals to respective said second control signal inputs to control discharge of the charge on said respective capacitances.

16. (Canceled)

17. (Original) The apparatus of claim 1 or 13 wherein said first control signals are controlled to provide uniform droplet volumes or velocities from said plurality of droplet ejection devices.

18. (Original) The apparatus of claim 1 or 13 wherein said first control signals are controlled to provide predetermined different drop volumes or velocities from different droplet ejection devices so as to provide gray scale control.

19. (Original) The apparatus of claim 3 or 15 wherein said first and second control signals are controlled to provide predetermined different drop volumes or velocities from different droplet ejection devices so as to provide gray scale control.

20. (Previously Presented) The apparatus of claim 3 or 15 wherein said first and second control signals are controlled to connect said electrical signal to respective said piezoelectric actuators for respective predetermined times.

21. (Previously Presented) The apparatus of claim 1 or 13 wherein respective said first control signals are controlled to connect said electrical signal to respective said piezoelectric actuators until respective said piezoelectric actuators achieve respective predetermined charge voltages.

22. (Original) The apparatus of claim 1 or 13 wherein said first control signals are controlled to provide a voltage that is insufficient to eject a droplet, but is sufficient to move a meniscus of a liquid at an ejection nozzle of said droplet ejection device.

23. (Original) The apparatus of claim 3 or 15 wherein said first and second control signals are controlled to provide a voltage that is insufficient to eject a droplet, but is sufficient to move a meniscus of a liquid at an ejection nozzle of said droplet ejection device.

24.- 25.(Canceled)

26. (Previously Presented) The apparatus of claim 3 or 15 wherein said first and second control signals are controlled to vary the amplitude of charge as well as the length of time of charge on said piezoelectric actuator for the first droplet out of a droplet ejection device so as to match subsequent droplets.

27. (Original) The apparatus of claim 1 or 13 wherein said apparatus is an inkjet print head.

28. (Previously Presented) The apparatus of claim 1 or 13 wherein said controller includes a field programmable gate array on a circuit board mounted to a monolithic body in which said fluid chambers are formed.

29. (Original) The apparatus of claim 1 or 13 wherein said controller controls said first switch as a function of the frequency of droplet ejection to reduce variation in drop volume as a function of frequency.

30.- 35.(Canceled)